Sentient Cities:

Ambient Intelligence and the Politics of Urban Space

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Abstract

Increasing amounts of information processing capacity are embedded in the environment around us. The informational landscape is both a repository of data but also increasingly communicates and processes information. No longer confined to desk tops, computers have become both mobile and also disassembled. Many everyday objects now embed computer processing power, while other are activated by passing processors. The distributed processing in the world around us is often claimed to be a pervasive or ubiquitous computing environment. A world of ambient intelligence, happening around us on the periphery of our awareness, where our environment is not a passive backdrop but an active agent in organising daily lives. The spaces around us are now being continually forged and reforged in informational and communicative processes. It is a world where we not only think of cities but cities think of us, where the environment reflexively monitors our behaviour. This paper suggests we need to unpack the embedded politics of this process. It outlines the key dynamics in terms of environments that learn and possess anticipation and memory. To examine the assumptions and implications behind this the paper takes three contrasting visions of 'sentient' urban environments. The first addresses market led visions of customised consumer worlds. The second explores military plans for profiling and targeting. Finally, the third looks at artistic endeavours to re-enchant and contest the urban informational landscape of urban sentience. Each we suggest shows a powerful dynamic of the environment tracking, predicting and recalling usage.

Introduction

The 1990s have been characterised as the decade of the virtual (Manovich 2006). Information and communication studies were preoccupied with notions of a dematerialisation and refiguration of identity. A great deal of both utopian and dystopian writing focused upon the alleged transcendence or loss of physicality and its replacement with new spaces and fora online (Graham, 2004). It has become a well established critique to point out that, far from forming an even and seamless electronic realm, there is a structure and geography to informational worlds. Thus, much writing has pointed to the persistence of divides in infrastructure and capacity, indeed the concentration of capacities and capitalisation on location in new technology clusters and developments both in terms of connectivity (see for example Zook 2002) and social milieu that if anything become more vital for media knowledge workers (see for example Pratt 2002). Confining informational space to some 'global space of flows' that is 'out there,' as Castells' (1996) influential work does, also has stark limits, in part because it implies an equation of the human with the near and local, the slow and the small (Thrift 2004: 54). This seems problematic when these transnational flows are actually deeply

embedded in ways that mean that many 'urban residents begin to experience the 'local' as a type of microenvironment with global span' (Sassen 2006: 23). The relationship and effect on place of accelerated mobile information is thus dialectical. As Sassen puts it:

> 'much of what is liquefied and circulates in digital networks and is marked by hypermobility, actually remains physical – and hence possibly urban – in some of its components. At the same time, however, that which remains physical has been transformed by the fact that that is represented by highly liquid instruments that can circulate in global markets' (Sassen 2006: 24).

What happens to places and people in networked environments where small informational devices and data are brought together – repeatedly, in real-time, and automatically, through systems that sink into the urban background? This paper attempts to outline some of the possibilities which open up when the city becomes a haze of software as much as being bricks and mortar (Amin and Thrift 2002). It follows Weiser's famous dictum that "the most profound technologies are those that disappear. They weave themselves into the fabric of everyday life until they are indistinguishable from it" (Weiser 1991: 1). Instead of a story of the substitution of electronic media for physical encounter, then, we want to build an account of the permeation of the daily environment with communication technologies in 'a space in which the public is reconfigured by a multitude of media and communication networks interwoven into the social and political functions of space to form a "hybrid space"' (Kluitenberg 2006: 8).

In this paper we particularly want to explore some of the political implications of the embedding of computing into the background environments of cities. We also want to pay attention to the wider urban and technological imaginaries that surround this process. Our particular focus here is on what are often termed pervasive computing or ubiquitous computing (the so-called 'ubicomp'). Building on previous work that looks at the informational overcoding of environments, usually via geodemographic data, in complex and recursive fashions, we suggest that the interaction of data and processing produce new patterns of stratification (see for example Burrows and Ellison 2004; Burrows and Gane 2006).

In what follows we explore three key contemporary domains within which the reconfiguration of cities and their politics are being actively imagined and enacted. This

is going on, we suggest, through the production and dissemination of technological fantasies, the more practical processes of technological development, and the actual deployment of, and contestation over, operational ubicomp systems. These three vignettes address commercial fantasies of 'friction-free' urban consumption; military and security industry attempts to mobilise ubiquitous computing to the 'war on terror'; and attempts by artists to interrupt fantasies of perfect urban control through artistic use of new ubicomp technologies to try and re-enchant urban space and urban life. Before addressing these three areas in turn, however, it is necessary to take a brief conceptual excursion into the complex political and analytical challenges raised by the shift to urban worlds which are continually ordered, animated and brought into being by interlinked computerised systems, which blend seamlessly into the urban background.

Promises and Dreams of Ubiquitous Computing

Urban ubiquitous computing systems entwine people, place and software in complex ways. Software and algorithms code people, places and their data in interrelated systems that are then used to profile and drive decision making systems. This raises a key question: What happens when the processing and not just the data is embedded in the everyday environment?

The rising concern with the embedding of software in the environment marks a notable shift from much critical writing of the nineties that focused upon the screen sometimes as a space in its own right, but more often as a barrier or impediment to encountering the world (Friedberg 1993, Graham, 2005). Instead, debate has moved 'toward embedding information technology into the ambient social complexities of the physical world' (McCullough 2004: ix). In a world of pervasive or ubiquitous computing, lingering assumptions about processing being conducted in offices and in discrete artefacts called computers may well obscure rapidly developing processes. Already, less than a quarter of chips produced by Intel are destined for desk-top computers (McCullough 2004: 5) and for many young Japanese the permanent networked capacity of DoCoMo *ketai* (i-mode standard cell phones) is their first, and most common, way of being 'on-line' (de Souza e Silva 2006: 263).

To clarify some of the dimensions that concern us here, it is useful to develop a typological conceptualisation of the multiple ways in which urban environments might become animated through ubiquitous computing systems hidden in the background of the city. We would point to four distinct but related possibilities or approaches here.

Augmenting Space

The first approach points out that the built environment has been saturated with information for centuries – from signage to adverts. Indeed these literally overwhelmed various spaces – not just the high iconography of ceremonial sites but looking at the ordnances in London periodically, and by implication with only moderate success, limiting shop boards that threatened to physically block traffic (Ackroyd 2001). The overlaying of new electronic media produces a less stable topography, that is both uneven and in ceaseless flux (Kluitenberg 2006: 8). The oft-heralded version of this is 'augmented reality' which attempts to 'overlay physical objects with virtual objects in real-time and allows people to experience the virtual as if it were real' (Galloway 2004: 390) and has generally aimed to allow the user to 'see the "real" world with overlaid graphical data' (de Souza e Silva 2006: 264).

The significant shift to 'augmented space' is overlaying physical space with dynamically changing information, multimedia in form and localized for each user where the data forms an always connected, pervasive environment rather than necessarily appearing in our field of vision (Manovich 2006: 220). The novelty is the real time alteration of the data, the convergence of different forms of access and its personalisation. The screen is mobilized and goes traveling, becoming embedded in our environment rather than separating us from it. The term augmentation in that sense reflects media adding to our experiential world not taking it over (p225). It speaks a language of enhancement and new capacities, alongside a sensible recognition of incremental rather than epochal changes.

Enacting Space

The vision of augmented spaces tends to produce a sense of superimposed but passive environments – the emphasis is on the different spaces rather than the activity. So for a

different, second, emphasis we might turn to Dana Cuff's depiction of the city as now made of 'Cyburgs' which are 'spatially embodied computing, or an environment saturated with computing capability. It is the imminent stage of digital media that places computation in all things around us, from our own skin and bodies (biotechnology and nanotech medication), to our clothing, to our cars, our streets, our homes, and our wildernesses' (Cuff 2003: 44).

In enacted space, the computer moves to inhabit the most ordinary of things to produce an 'enacted environment'. She suggests that while it is an enhancement of our capacities it relocates agency into the world:

> 'Our own agency is enhanced by the cyburg, for we can know and act in more powerful ways. Complementing our empowerment is the newly enacted environment. Not only do the walls have ears, but networks of eyes, brains, and data banks to use for purposeful action. Although we are reluctant to attribute agency to objects in our surroundings, it is a stance that won't survive long' (Cuff 2003: 44)

Transducting Space

This suggests that we need to think through the technological agency of ubiquitous computing more carefully. And here our third strand of approaches may help. Leaning on the work of Simonden and others it focuses on capacities such as technicity (the productive power of technology to make things happen) and transduction (the constant making anew of a domain in reiterative and transformative practices) (Dodge and Kitchin 2005: 162). This moves perhaps to a more functional and instrumental understanding of technologies – or rather to see that they are most often used for these ends. This study focuses upon the 'coding' of people, places and objects – that is processes of identification and then the layering and cross-referring of these identifications through software algorithms. Thus it about how codes offer modes of address – both locating and hailing people and things. Thrift goes so far as to suggest this forms a 'technological unconscious' through 'the bending of bodies-with-environments to a specific set of addresses without the benefit of any cognitive inputs, a prepersonal substrate of guaranteed correlations, assured encounters, and therefore unconsidered anticipations' (Thrift 2004: 177).

The focus on how this enables action leads Dodge and Kitchin (2004: 198) to distinguish 'coded space', where information is inscribed digitally that enhances the functioning of a particular environment, and 'code/space', where information and space are so fused that the space cannot function without the information and there is no uncoded, manual alternative. In part the enhanced 'technicity' these environments offer comes down to coded objects being networked, through more codes and these enabling coded processes to organize new forms of action (transduction) (Dodge and Kitchin 2005).

'Blogject' Space

Finally, such an approach might also lead us to Bleecker's (2006) notion of the 'blogject': an artifact that develops data through tracings its use or movement. In this he takes forward the notion of the 'Internet of Things' Internet of Things from 'a nascent conceptual framework for understanding how physical objects, once networked and imbued with informatic capabilities, will occupy space and occupy themselves in a world in which things were once quite passive' to one that sees things as fully agentive players (Bleecker 2006: 1-2). Thus blogjects move from artefacts which are coded to hold data locally but can be connected to wider systems by users, to those who communicate themselves among a limited system without user intervention and rhizomic blogjects that depend upon a network to function by developing and storing data off site. The focus is upon a form of agency for these objects. Thus:

> 'Agency as I am using it here does not just mean a local "artificial intelligence" that makes a Blogject able to make autonomous, human-like decision or fashion croaky human-speech from text. Blogjects have no truck with the syntax of human thought. Things could not care any less about their Turing Test report card. Blogject intellect is their ability to effect change. Their agency attains through the consequence of their assertions, and through the significant perspective they deliver to meaningful conversations. (Bleecker 2006: 9)

In other words, 'blogject' space is about reformulating agentive properties that transverse the object-subject border. The environment acts, as it always did, but now with software code as a medium.

In this appaoach, we move to active sense of coding as about making places happen – not in specific or discrete moments but continually. This means seeing that 'spaces depend upon the gradual construction of complex ethologies of bodies and objects, which are repositories of the 'correct' positionings and juxtapositionings that allow things to arrive and become known … the modest but constant hum of connection and interconnection that they make possible' (Thrift 2004: 175). This is an ontogenetic understanding of space which sees it as continually being brought into existence through everyday transductive practices (Dodge and Kitchin 2005: 162). Technologies are everyday events which involve spatialization, temporalization and embodiment simultaneously (Galloway 2004: 404-5).

With such a perspective established we can now turn to our three explorations of key areas of urban ubiquitous computing: fantasies of 'friction free' urban consumption; dreams of securitised urban ominiscience surrounding the 'war on terror; and the efforts of artists to imagine very different dynamics of urban ubiquitous computing.

Fantasies of Friction-Free Consumption

Locating consumers

The notion of active and learning spaces has long been touted in terms of the possibility for a customised consumer paradise where goods can be found on demand – or, even better, before we realised we needed them. A variety of technologies build up profiles of preferences 'memorising' our actions in places. Past patterns of purchase no longer need to be manually 'bookmarked' but form self-generated 'favourites' lists of goods regularly purchased (for instance in online supermarkets) and from thence it is but a short step to the lists of 'suggestions' compiled from those preferences (as in Amazon or many e-tailers). If online stores can remember their visitors, the possibilities of tags and coding mean 'real' stores and locations might also do so. In that sense spaces begin to have both a memory and anticipation of uses. Thus a shop might read an RFID in a mobile phone and produce a customised list of favourite or usual services or alert a specific member of staff. It is in effect 'projecting the interactive model of cyberspace back into physical space. The metaphor of cyberspace has, in other words, come full

circle' (Andrejevic 2003: 134). Location starts to organise the interaction. Firstly, spatial databases allow the selection of services based on location or proximity criteria. Secondly, mobile media offer the possibility of centring such searches on the current location of the user. In some senses, it is what is so common with mobile phones – people coordinating their lives through frequent exchanges about their location (Laurier 2001). Geolocation technologies take this further and offer the possibility of devices automatically knowing where they are (receiving locative data) or saying where they are (transmitting it) or both.

Searching tailored to location has been hailed as the 'killer app' for mobile network devices enabling a 'data-driven mass customization based on continuous, real-time monitoring of consumers' (ibid.: 133). Except it has been hailed so often that it might make one wary of why it has not yet caught on (Sweeting 2005). There are technical issues in learning and responding to the preferences of consumers -- just imagine the awful moment of Microsoft's office assistant ('Hi! You appear to be writing a letter…') loosed upon the planet ('Hi! You appear to be near our shop…') (McCullough 2004: 15). Equally, while mobile phones may carve the city up into 'cellspace' (Manovich 2006), these vary in size and signal triangulation is complex allowing only rough approximations for location, and, while satellite positioning systems are becoming common, they are by no means universal in either reception or embedding in devices. More crucially, the commercial logics of who would provide spatially referenced data on providers, who would provide it about users, who would make devices produce this data and who would work out the middleware to translate all these codings and who would profit from this have so far stymied many attempts. The technology exists, though it is not seamless, but the business model or operation is less solid.

The promises though are large and better than just finding a shoe shop when and where you need one. We might look at the possibilities for traffic organisation and trip sharing schemes. The car pool is an oft touted element in environmental policies for reducing traffic. So far larger scale initiatives have often been thwarted by the lack of trust among large groups of unacquainted users and the complexities of coordinating large numbers of movements between different starting and end points at different times via different routes, with varying traffic conditions, subject to changes of demand at short notice. So most commercial providers work by either restricting the routes and set down and pick

up points (the 'bus solution') or demanding advanced planning. However geolocation technology and geosensors offer the possibility of changing this. Rather than a vast central data base, an augmented informational landscape would continually provide data on the location and direction of vehicles, that could be picked up and sorted by those with receivers wishing to travel. Distributed sensors and computing would make it a collaborative task through ad hoc automated peer to peer communication (Winter and Nittel 2006).[i] It offers the prospect of something like an electronic thumb for the twenty first century. Of course, it does not build trust in other users in and of itself -- that might entail another coding and sorting of people with different implications.

Tracking objects through the world

These locative technologies all seem a long way from the heady proclamations of the dot.com boom that all commerce would move online. The effect of code has been the production of bricks'n'clicks assemblages of electronic and material provision in this augmented landscape. Corporations rely upon connecting demands through to supply chains and as more commerce of all sorts entails lengthening supply chains of increasing complexity, it is not just e-tailers that are deploying ever more sophisticated means of tracing their inventory. The smooth flow of goods in response to demand has become a key issue for global capital whether the customer request is initially electronic or whether the firm translates it into one. In this climate we can see the rise of technologies such as the Radio Frequency Identification (RFID) chip. The various types of this device can be attached to just about anything and used to record or code its identity. More expensive variants allow this data to be modified to record the handling and processing of an object, and while the majority are 'passive' devices and wait until a reader comes within a few metres, some others are powered and actively broadcast information. For large corporations and logistical companies 'RFID is a dream come true; a dream of controllability, transparency and efficiency as regards the worldwide tracing of goods' (Kluitenbrouwer 2006: 51).

If we take the RFID chips that allow recording these create objects with memories, or indeed to become networked 'blogjects', that may be connected up and called forth to compose a life log (Dodge and Kitchin 2007). Thus pervasive environments may

produce seamless data trails across a number of devices. We thus have a combination of:

> ‘technologies [that] constitute ‘history-enriched’ digital objects that can produce autobiographical traces some of which objects are supplemented with profiling programmes that adapt them to personal preferences (eg, automatic interface customisation, predictive texting on mobile phones, etc) and thus learn or build in anticipation as well as memory. These automated forms of datalogging and personalization are being complemented by technologies for the conscious self-creation and public sharing of these personal material, for example, through blogging and webcams’ (Dodge and Kitchin 2007: 434).

There are then clearly issues of who accesses and controls this assemblage of data. Indeed, the issue would seem to be not one of blanket privacy but control over interchange of information where people want the benefits of tailored products but to do this by selecting which information is given and received to and from whom (Kluitenbrouwer 2006).

One project currently being trialled that might illustrate this is the Windows Mobile application AURA launched in December 2006. The acronym stands for Advanced User Resource Annotation and it aims to ‘connect shoppers on the go to a world of information about products’ (MS press release). It depends upon objects being ‘coded’ in this case with a bar code. The technology means that with an AURA-enabled device you can use a digital camera to snap the bar code on a product, which it will relate to the database held by Microsoft and will return links and search results about the item to the handheld device. Initially this could be as simple as an on-the-go product price comparison service but Microsoft hopes everyday users would eventually augment the information AURA delivers by posting reviews and other details about things they buy or own. Microsoft’s in house anthropologist Marc Smith argued previous applications failed because people weren't regularly carrying portable devices with the processing power, wireless connectivity and cameras to make such a service feasible and easy. He sets AURA in the context of social software: "Now we have to ask ourselves, what's the social application, what's going to happen when millions of people have these devices?"

and thus what it offers is "a little taste of what the future be like when you can walk up to any device and interrogate it and annotate it" (Smith 2006).

Conversely, objects you cannot code become mute. Already a scheme ThingLink (Kluitenbrouwer 2006: 55-6) aims to help handicraft producers to give any object a digital reference on an online database to make them visible to Google and other e-commerce portals. In other words things which are not coded start to become literally dumb. And among those uncoded things may well be people. ‘From the perspective of these emergent forms of ambient intelligence, unwired humans will come across as singularly unintelligent, non-conversant and incomprehensible’ (Andrejevic 2005: 103). Indeed, the overall logic of this ‘m-commerce’ might be said to be about delegated agency and moving agency away from people – creating not heightened frenetic communication but new forms of passivity (Andrejevic 2005: 101). The effect though is one where distributed processors increasingly recall our lives, the traces of our movement and use that to anticipate what we might later do. In this we want to suggest here are striking parallels with recent plans and developments in the militarization of urban space.

A ‘New Manhattan Project’: Ambient Intelligence and the ‘War on Terror’

> “The time has come to change the perception that the high-tech US war machine fights at a disadvantage in urban areas” (Houlgate, 2004).

A second key theme in discussions about the reconfiguration of urban spaces through ubiquitous computing centres on imperatives of securitization. In particular, the imagination, development and deployment of myriads of new sensing and surveillance systems into city spaces are at the heart of efforts within the so-called ‘war on terror’ to both securitise western or ‘homeland’ cities and to counter insurgencies within war-zone cities in the colonised frontiers of the global south. In both domains, the key dynamic centres on attempts at rendering complex urban flows and structures permanently transparent to tracking and surveillance systems. In military jargon, cities and the complex infrastructure grids within and between them, are now deemed to be the central ‘battlespaces’ in which terrorists and insurgents who are largely indistinguishable from the wider urban background and thus can not be easily identified, tracked, or targeted.

‘Identity Dominance’ in ‘Asymmetric Warfare’

The key to this new type of conflict, which profoundly embeds the new ‘battlespaces’ in urban civilian life, is to mobilise ambient intelligence. Embedded in cites and urban infrastructures, to provide the ‘battlespace awareness’ necessary to identify, track and target lurking insurgents, terrorists and other ‘targets,’ and so provide western forces with what John Woodward, of RAND’s Intelligence Policy Centre, calls “Identity dominance” (McCue, 2005).

Thus, military, defence and surveillance industries are offering ambient technologies such as RFID tags, algorithmic video cameras, data mining and biometrics as means to unveil the logistical, transactional and geographical movements of the human and non-human ‘targets’ of the war on terror. Prototype pervasive processors called ‘Smart dust’ were released in 2001, they were powered by solar energy and able to communicate about the environment they found themselves in, from San Francisco to Berkeley even if, at 7mm in length, they were not (yet) wind blown as intended (McCullough 2004: 73). This is being done in a context where the complexity, density, dynamism and scale of urban centres are widely deemed by US Defense analysts to undermine the high-technology advantages of western state militaries. The new military focus is on informal, non-state terrorists and insurgents who blend into the background of the cities, city networks, and urban infrastructure systems they both choose as the bases for their actions, and exploit in their targeting operations.

An excellent example of the ways in which ambient intelligence technologies are being portrayed as central mechanisms through which to wage the ‘war on terror’ comes from a major report published by the Pentagon’s Defense Science Board (DSB) In December, 2004. One of many attempting to draw early military lessons from the urban insurgency in Iraq, this report was startling for one reason. It deliberately called for what it called a ‘New Manhattan Project’, invoking the code-name famously used in the 1940s to describe the massive programme which developed of first atom bombs used to devastate Hiroshima and Nagasaki in May1945 (Figure 1). It urged a similar concentration of military resources on what the Board saw as the key strategic priority for the 21st century: the technological unveiling of cities and urban life. Specifically, it saw possibilities to exploit ubiquitous computing technologies in developing a massive,

integrated system of surveillance, spanning the world, and tailored specifically to penetrating the increasing complexity of urban life. Such a system, it argued, would once again render the US military's targets trackable, locatable -- and destroyable. The purpose of the New "Manhattan project", then, was seen to be to "locate, identify, and track, people, things and activities -- in an environment of one in a million -- to give the United States the same advantages in asymmetric warfare [as] it has today in conventional warfare" (DSB, 2004, 163). Strategically, the ideas of the report have been cemented as one of eight principle development areas into the New Pentagon strategy for a 'Long War issued in 2005.'

FIGURE 1 ROUND HERE

The United State's hegemonic capabilities for surveilling the earth from the distant, vertical domains of air and space were deemed by the DSB to have "poor capability for finding, identifying and tracking" what it calls "unconventional war targets" (DSB, 2004,153) such as "individuals and insurgent or terrorists groups that operate by blending in with the larger society" (Figure 2). Crucially, intimate and persistent military surveillance systems were needed which penetrated the details of everyday urban life. As the report put it, little less than a comprehensive rescaling of military imaginations of surveillance was needed and "more intimate, terrestrial, 21st century ISR [Intelligence, surveillance and reconnaissance] were required" (DSB, 2004, 2). The gaze of hegemonic military power, the report argued, thus needed colonise not just the planetary scales of surveillance; it also needed to penetrate the fine-grained and local geographies of urban and infrastructural 'battlespaces.' Such a transformation was imagined to be profoundly temporal as well as geographical. "The surveillance of people, things and activities required to populated the databases needed for identification, location and tracking," the authors write, "will require a persistence beyond that typical of many of today's" military and security surveillance systems. These new surveillance systems, profoundly local and global at the same time, will, in other words, need to be 'always on' . This will allow them, through "evidence-correlating and backtracking algorithms" (DSB, 2004,159) to call upon memories, via databases recording the history of movements and associations of things, activities and people, and anticipate, so that threatening and 'abnormal' behaviours and emergences can be detected and dealt with before the point of terrorist or insurgent attack.

Figure 2 ROUND HERE

The new 'Close-in, terrestrial means" of surveillance, intelligence and targeting centre on the 'data mining' and tracking techniques familiar from the commercial aspirations. To achieve this, biometric sensors will need to verify and code people's identities, as they flow through national or other borders, through finger/palm prints; iris scans; DNA; face-recognition; voice recognition; even odour and gait recognition (Figure 3). (The DSB report favours combinations of iris and fingerprint scans, combined with face recognition, as "offering a reasonably effective compromise among speed, accuracy, ease of implementation and cost" (DSB, 2004,159). A wide range of technologies deploying algorithmic calculation, tracking and data mining are being deployed to reconfigure passport systems, borders, even public transport transactions, based on the biometric tracking of identities. All of these centre on combinations of data mining, risk-profiling, attempts at pre-empting risk, and identifying purported 'targets of interest' through what Louse Amoore has called "war-like architectures of self/other" (Amoore, 2007, 1). They will also connect objects and itineraries, in to blogjects, storing data of who comes into contact with what and when. On the ground, biometric means of bordering, population control and incarceration have been widely employed in Iraq, notably in the city of Fallujah (where all remaining residents have been given ID cards embedding both finger prints and retina scans which must be used to pass through fences and checkpoints encircling the town). Meanwhile, new projects titled 'Transparent Urban Structures' and the 'Visibuilding' program have been funded which seek to build sensors which automatically penetrate the built fabric of cities.

FIGURE 3 ROUND HERE

'Combat Zones That See'

A particularly interesting project embracing the ideas of the DSB report is the tellingly title 'Combat Zones That See' project set up by the US Defense Advanced Research Projects Agency (DARPA). Launched at the start of the Iraq insurgency in 2003, CTS "explores concepts, develops algorithms, and delivers systems for utilising large numbers (1000s) of algorithmic video cameras to provide the close-in sensing

demanded for military operations in urban terrain" (DARPA, 2003, 4). Through installing computerised CCTV across whole occupied cities, the project organisers envisage that, when deployed, CTS will sustain "motion-pattern analysis across whole city scales", linked to the tracking of massive populations of individualised cars and people through intelligent computer algorithms linked to the recognition of number plates and scanned in human facial photos to provide close-in, continuous, always-on support for military operations in urban terrain" (DARPA, 2003, 6).

The Politics of Anticipatory Seeing

The work of the Defence Science Board is just one small example of a vast complex of research and development driven by the apparent inability of western militaries, police security agencies to actually identify, track and locate their 'targets' within a globalizing and urbanising 'battlespace' where any simple separation of the home city from the hostile one breaks down. Absolutely crucial in these emerging surveillance systems is a radically new politics of anticipatory seeing. For the overarching feature of the new, militarised, surveillance push, whether its 'targets' are located in Manhattan and Baghdad, London and Fallujah, is an attempt to build systems of technological vision in which computer code itself is, along with databases of real or imaged 'targets', delegated with the agency of tracking and identifying 'abnormal' 'targets' from the background 'normality' of a homeland or war-zone city. (After all, no system directly supervised by humans ca n ever hope to cope with the amount of data generated by surveillance system which, in effect, attempt to capture all of life itself).

Crucial here is the adaptation of the commercial practices of 'data mining' or 'predictive analytics' where algorithms are developed to look for patterns in the swathes of captured date, identify or profile behaviours or characteristics deemed to be 'unusual' or 'abnormal', and search for 'target' people, transactions or flows deemed to have such characteristics (see McCue, 2005 and Pruett, 2005)).

Jordan Crandall, an influential media theorist, has gone furthest in analysing the shift towards ubiquitous high-tech tracking, anticipatory profiling, and colonial, military power. To Crandall, "tracking is integral" to the emerging modes of governance and sovereign and military power based on anticipatory seeing. " (Crandall, 1999) The key question

now, he suggests, is “how targets are identified and distinguished from non-targets” within “decision making and killing.” (Crandall 1999) Identifying such targets becomes the role of statistical algorithms which sift the mass and flux of registered and sensed data searching for [what Mark Seltzer has teemed] ‘statistical persons’”. Most important here is that all potential ‘targets’ must be incorporated into databases in the first place. Indeed, the existence of a signature in a database increasingly defines citizenship in this new age: “frequently [...] there is no person who exists outside of the database” (Crandall 1999).

To Crandall, this widespread integration of computerised tracking with databases of ‘targets’ represents little but of “a gradual colonization of the now, a now always slightly ahead of itself” (Crandall 1999). This shift represents a process of profound militarization because the social identification of people within civilian law enforcement is complemented or even replaced by the machinic seeing of ‘targets’. “While civilian images are embedded in processes of identification based on reflection,” writes Crandall, “militarised perspectives collapse identification processes into “Id-ing” - one-way channel of identification in which a conduit, a database, and a body are aligned and calibrated” (Crandall 1999). Again, this is central to the relationship between the application of identical surveillance systems in both homeland and war zone securitisation. Crandall suggest that the new capacity of anticipatory seeing involves a kind of ”armed vision where the capabilities of vision are “upgraded and made safe against an unprocessed exteriority, a dangerous and unreliable outside” (Crandall 1999).

Technophiliac Imaginings: Perfect Power

As is common in the development of new US military capabilities, technophiliac fantasy plays a major role in discourses surrounding new ambient technology projects. Invariably, these portray perfect technological omniscience against the new challenges of assymetric warfare as ushering in a new world of ‘clean’ war where the Clauswitzian fog and friction war is overcome for ever. Crucially, after the horrors of the streets of Iraq, US personnel are, once again, removed from the increasingly automated and cyborgian projection of perfect power into the metropolitan spaces which hide America’s new enemies.

In 2004 *Defense Watch* magazine, for example, developed one scenario in response to the news about the 'Combat Zones `That See' programme discussed above. "Several large fans are stationed outside the city limits of an urban target that our [sic] guys need to take", they begin:

> "Upon appropriate signal, what appears like a dust cloud emanates from each fan. The cloud is blown into town where it quickly dissipates. After a few minutes of processing by laptop-size processors, a squadron of small, disposable aircraft ascends over the city. The little drones dive into selected areas determined by the initial analysis of data transmitted by the fan-propelled swarm. Where they disperse their nano-payloads."

"After this, the processors get even more busy", continues the scenario:

> "Within minutes the mobile tactical center have a detailed visual and audio picture of every street and building in the entire city. Every hostile [person] has been identified and located. From this point on, nobody in the city moves without the full and complete knowledge of the mobile tactical center. As blind spots are discovered, they can quickly be covered by additional dispersal of more nano-devices. Unmanned air and ground vehicles can now be vectored directly to selected targets to take them out, one by one. Those enemy combatants clever enough to evade actually being taken out by the unmanned units can then be captured of killed by human elements who are guided directly to their locations, with full and complete knowledge of their individual fortifications and defenses […]. When the dust settles on competitive bidding for BAA 03-15 [the code number for the 'Combat Zones That See' programme], and after the first prototypes are delivered several years from now, our guys are in for a mind-boggling treat at the expense of the bad guys" (2004, sic.)

Art and Activism: Reenchanting and Reanimating the City?

Amid these commercial and military dreams there are incraesingly widespread calls – and this is our third area -- to try to realise and reclaim the potentials of augmented spaces through art and acticism. Explicit calls have been made to both open up the

spaces and simultaneously to reveal these developing trends. 'The new hybrid space also calls for new forms of public action. These can only be created and facilitated if the users of hybrid space learn to see the influence of relatively invisible digital structures and appropriate their technology where possible for alternative use.' (Kraan 2006: 39). In this section, then, we want outline some critical praxis and interventions that have aimed in various ways to challenge or subvert (some aspects of) the dominant commercial and military visions.

Art and Augmented Environments

Some artistic endeavours simply render noticeable the augmented environment as in the Intelligent Street that monitored predestrian activity levels and used these to produce a responding ambient sound reflecting the bustle of the street. Others employ the embedded technology of bio-surveillance. Christian Nold, for instance, sees Bio Mapping (http://www.biomapping.net/) as about enabling individuals to make use of gathered information about their own bodies. Instead of security technologies that are designed to control and surveille our behavior, his work envisages new tools that allow people to selectively share and interpret their own bio data. By sharing this data we can construct maps that visualize where we as a community feel stressed and excited. Thus in both Greenwich Emotion Map (October 2005 - April 2006 http://www.emotionmap.net/) and San Francisco Emotion Map (March 2007 - April 2007, SoEx gallery) projects, local residents borrow a 'bio mapping' device, that records galvanic skin responses, to go for a walk and the data is used to produce an interactive Google Mush to provide a different encoding of urban space. There are also deliberate attempts to counter some hegemonic practices we have laid out in the preceding sections. Thus the New York based Preemptive media project aimed to challenge the tracking of products with its intervention 'Zapped!'. This entailed fitting hissing cockcroahes with RFID tags and then releasing them in Walmart. The effect was to pollute and corrupt databases as the creatures broadcast digital 'noise' as they moved though the store (Kluitenbrouwer 2006: 54). The associations of dirt and pollution carried over to digital pollution are a direct challenge to the visions of sanitised and transparent corporate spaces. However, our interest is less with direct challenges than the many interventions that together form an alternate animation of the environment.

In this we want to point to the attempts to both foster social contact but also to focus upon the sorts of spaces created and envisioned. We want to highlight that the places created involve less of the 'anticipation' of action than the inscription of memory. This is connected to enabling specific new social performances. We want to take these through three overlapping registers. The first take the data coding of the environment and seek to make it transparent and/or aesthetically problematic. The second are those that seek to re-enchant the environment through multi-authored overcodings. That is they take augmented space but seek to pluralise the authorship. The third are those that seek to foster new engagements with the environment by promoting new practices of direct contact and association. In this sense both the last two draw upon the notions of social networking and collaboration through dispersed and networked devices, taking virtual community out of the wires and onto the streets.

In part these artistic experiments with locative media can be characterised as responding to a depiction or criticism of the built environment as disenchanted and alienating. The locative media aim to offer a re-enchantment and reworking of the spaces through refashioning the overlaying of informational environments onto the landscape. In one sense this is not a unique task or ambition for locative media and yet the tailoring of response may be:

> 'the overlaying of different spaces is a conceptual problem that is not connected to any particular technology, we may start to think about which architects and artists have already been working on this problem. To put it another way, the layering of dynamic and contextual data over physical space is a particular case of a general aesthetic paradigm: how to combine different spaces together. Of course, electronically augmented space is unique – since the information is personalized for every user, it can change dynamically over time, and it is delivered through an interactive multimedia interface, etc. Yet it is crucial to see this as a conceptual rather than just a technological issue' (Manovich 2006: 225-6).

Manovich thus gives the guided audio walks of Janet Cardiff as an example that attempts to overcode the present city with memories of the past, to produce a space that is not quite of the now but is rather haunted by ghostly, technologically preserved or recalled presences (Pinder 2001).

Collaborative Authoring and Locative Media Projects

Collaborative authoring and locative media have greatly expanded the possibilities for these attempts to re-enchant the world. Some projects such as 'Pedestrian: A Walking Tour for Multiple Voices and Portable Phones- New York City' (http://www.pedestrianproject.com/id1.html) stages the aural publicity of new media that has turned us all into audiences of one half of so many conversations. Three guides set out to take a walking tour around the East Village in New York pointing out lost elements of landscape (such as gay bathouses replaced by petrol stations), with audiences choosing to follow one of the guides but being able to overcode this by listening to two others taking different routes. Here we have a double play of presence, haunting and topography. Other projects push the collaborative sense of new media allowing them to record the multiple memories and histories of places. They thus attempt to record and give a voice to the myriad of invisible histories and myths of places. Where once there were official and dominant memories inscribed on the city now these stories from below can be added.– In Michel de Certeau's terms, the dispersed knowledges of practices replace the homogeneity of single rationales (de Certeau 1997: 116) and open space to difference, since stories about places are makeshift things, composed of the world's debris (de Certeau 1984: 107). His suggested mode of knowledge through travel where practices have no place of their own but move in the territory of the other (de Certeau 1986: 202) would speak to the unstable multiply coded and fleeting geographies of these tours.

De Certeau was ontologically sceptical of attempts to stabilise such knowledge, suggesting it ossified and drained the very life he celebrated, cautioning us that science could never make princesses of all these Cinderellas (1984:67) for that would necessarily reduce them to representations rather than practices. However, with multiple authored web sites the technological optimists would say we can do just that. Thus, projects such as Murmure (http://murmure.ca/) first launched in Toronto's Kensington Market in summer 2003, then Vancouver's Chinatown and then Montreal allows people to take a web based map and tag sites with stories and memories of what the places mean to them in a form of 'intimate commemoration'. Many other projects have developed this theme especially the possibility of collaborative authoring connected to

locative media. Perhaps we might see this as evidence that if 'as is so often claimed, content is king, then surely the most valuable and relevant content about local places for local people is not going to come from media companies, but directly from their peers and neighbours?' (Lane 2004: 4). The German based Yellow Arrow project (http://yellowarrow.net/index2.php) describes itself as a Massively Authored Artistic Project (in a parody of Massively Authored Online Games) which sets out to add depth to our world. It seeks explicitly 'alternative' accounts to be attached to places, as in its Guerrilla Innsbruck Map project, with Yellow Arrow stickers pointing to sites. These stickers are registered with your specific code and your thoughts on the place to which they point – that could be in prose, video or audio format. Anyone dialling in the code via phone or web can call up this material.

The Social Tapestries and Urban Tapestries projects (http://urbantapestries.net/), meanwhile, attempt to document the world as we experience it at street level an thus also adds a sense of bodily motion moving through and between sites. Explicitly drawing upon de Certeau's formulation of evasive memories and urban myths Through pervasive location based authoring. Here with tools such as the Feral Robot (automatically sensing and posting pollution data) alongside people posting stories, thoughts and experiences the aim is to build up an experiential spatial database which can be tapped into on the move via mobile phones. As you walk through the city then a range of additional supporting information of both interest and use is available and passed to you on a hand held screen. The aim is to show how pervasive technologies do not have to pacify us as consumers but can allow us to claim and mark our territory. But the aim is allow a community to share knowledge in as the title suggest interwoven layers of discourse over the topography of the city (Jungnickel 2004: 3). In this it takes inspiration from work on 'Songlines' both in Aboriginal contexts and other multimedia projects (such as that by Naureckas, Jim. Nd. *New York Songlines.* URL: http://www.nysonglines.com/) that attempt to disrupt 'flat' visions of space and community (Silverstone and Sujon 2005). It is perhaps significant to note that despite claims and accounts of ubiquity, processing power and control issues meant this was an experiment restricted to a small number of registered users. Indeed studies of users found many struggled to find a 'point' to the system, but often were enthusiastic about its ability to allow them to share experiences with meaningful others (Silverstone and Sujon 2005: 46).

Crucially, these initiatives do not aim to provide though merely a linguistic supplement or record of our daily engagement with the world. Rather, in de Certeau's terms, they show the little narratives that organise, frame and enable our engagement:

> 'These narrated adventures, simultaneously producing geographies of actions and drifting into the commonplaces of an order, do not merely constitute a 'supplement' to pedestrian enunciations and rhetorics. They are not satisfied with displacing the latter and transposing them into the field of language. In reality, they organize walks. They make the journey, before or during the time the feet perform it' (de Certeau 1984: 115-6).

The above projects thus take these to be spatial stories and work on how they act in the world. The system builds connective tissues of threads linking places following people's movements – both mental and physical.

As these spatial annotation projects move out into the world of motion perhaps brings us into the third kind of intervention with a stronger sense of fostering new engagements with the environment. Here the media is not just location based but mobile to foster what de Souza e Silva calls 'hybrid-reality' where networked communities move into hybrid spaces. Perhaps the best examples are hybrid-reality games. These are multiuser games played with cell phones equipped with location awareness and Internet connections that allow players to use city space as the game board. The most celebrated, and first commercially released, is perhaps *Botfighters*, produced in Sweden in 2001 by It's Alive though *Mogi* in Japan, released in 2004, is a similarly hybrid reality game. In Botfighter, a first person shoot'em game moves into the city as people tag each other in real space with mobile phone texts. Opponents track each other down in urban neighborhoods and streetsas their mobile phones provide them with information on where other opponents are (Shirvanee 2006). In Mogi, the main goal is to look for virtual creatures and objects spread around the city of Tokyo, which can be caught and uploaded into their cell phones. However, some creatures go out only at night, so players must go to specific places at specific times to capture particular creatures (de Souza e Silva 2006: 266-70).

Effects of Animating Spaces

In terms of animating spaces, then, we can see two key effects. First, both these games transform the city space into the game board so that the familiar space of the city is transformed into a new and unexpected environment. So it is 'as if the game creates an imaginary playful layer that merges with the city space, connecting people who previously did not know one another via mobile technologies according to their movement in physical spaces' (de Souza e Silva 2006: 272). Second, they work to create and foster new social communities, or socio-technical communities through locative performances. They bring people together into new formations – in the case of Urban Tapestries for using and understanding the neighbourhood, or for new socialities around games for *Mogi* or *Botfighters*. Thus as Shirvanee comments on *Botfighters* might say that as 'paths of social activity are made possible by the augmentation of geographic space with locative information, an invisible layer of association emerges. One prevalent activity of the mobile street culture is to engage in locative games' (Shirvanee 2006). There are many more such games that range from impromptu art or dance to developing shared knowledge on the haptic qualities of skateboard routes (a good starter list is provided by Galloway 2004).

We might then try and think this through with a sense of what this does to movement in space. Shirvanee (2006) picks on the metaphor of viscosity to try and describe the technoscial world of pervasive computing. By viscosity she is pointing to speed of events and resistance – where the denser the fluid the greater the resistance to velocity. These artistic media are trying to densify the liquid – not solidify places. Thus:

> 'When information can actively find you on the street, there is a viscosity of space that forms between strangers with locative media, creating landscapes charged with traces of others that have inhabited the same space. In this early stage of location-based media, a greater connectivity and interaction between people who share a common interest, is thought to hold the promise of invigorating the public sphere to create an awareness and, therefore, a vitality of activity and public dialogue in spaces that might otherwise remain stagnant. This density and cohesion is more or less explicitly opposed to notions of disorientation and distractedness in contemporary urbanity" (Shirvanee 2006).

Conclusions

One of our aims in this unusually wide-ranging paper has been to simply outline that there is a great deal of work going on developing and exploring pervasive computing from commercial, military and artistic angles. We have also wanted to show that all of these offer significant contributions to thinking about both what the urban environment might become but also into how we think about it.

The developments addressed in this paper suggest that -- in a world of augmented, enacted, transduced or 'blogjected' space -- we will no longer, even if we ever could, be able to see the environment as a mere passive backcloth for social action. At the very least the environment has always recursively influenced and been influenced by action. What these technologies do is to change the temporality of that action. Much writing has focused on the real-time nature of links - such as drawing down locationally sensitive data for transactions. But in this paper we have, rather, tried to add a sense that environments are now being saturated with *anticipatory* technologies. These profile users in more sophisticated ways that in the end possibly pacify that user by creating a delegated agency.

This, of course, risks delegating whole sets of decisions and, along with that, the ethics and politics of those decisions, to invisible and sentient systems which both blur seamlessly into local, urban environments, and enact and organise global and transational flows (Graham, 2005). Increasingly, then, the key technologies may not be about bandwidth or access but sensors – cheap, ubiquitous and of extremely high performance (McCullough 2004: 74). Instead of being intensively planned and rigged, they will use more and more local hop or unplanned communications where increasingly devices can 'poll' their locality.

These sensors, tags and processors will increasingly function passively, that is via delegation. Partly this is due to the sheer complexity of multiple interfaces is partly due to interfaces and technology too often being too varied for anyone to learn. The lesson we draw from the artistic endeavours is, first, that these technologies need to be made visible. If they simply become buried infrastructure without ever being visible to most users we shall surely miss the chance for many people to influence their development.

Second, they may contain memory and link to the past just as much as anticipation. They may offer the possibility of enriched community formation. Not indeed the embedded and static version of community but community as assemblage in flux, as turbulence and eddies in the data stream. Third, these approaches animate space but perhaps augment is the wrong word. The connotations are too solid. Better, perhaps, is a sense of destabilising spaces or haunting them with absent others – those rendered telepresent from different times and/or spaces. In this sense they serve to suggest, despite all the emphasis on locative technologies, that the 'warranting' of agents in specific spaces and times, is becoming more problematic – if not in fact down right vague. The double, indeed triple and quadruple, coding of spaces and people through narratives and information carried in digital networks may actually serve to disperse our notion of both person and place. This also demands a new conceptual imagination of space and time. Presence is no longer mere physical proximity. Instead it is a notion of attention or perhaps of temporal continuity – remaining with memories (Lane 2004) and having actions projected into the future

Thi, then, may offer the start of a more hopeful discourse regarding the disturbing trends currently towards the militarisation and surveillance of spaces through ubiquitous computing. We need to recall that these dreams of transparency and omniscience are long-standing. However, experience should tell us that 'omniscience is elusive. As anyone who has ever tried to resolve a simple billing dispute will know, even the telephone company lacks enough internal coordination to make sense of its data to you. And anyone who has ever dealt with a state-level bureaucracy knows, the odds of omni-competance remain low. Generally,' as information becomes more and more abundant, clear views trough it becomes less and less possible' (McCullough 2004: 15). The standards of pervasive computing are indeed allowing local polling and linked devices but this is not the seamless and unbiquitous process that many accounts suggest. The linking technology is generally a 'kludge', as software designers call it. That is a bricolage of component middleware, none of it really designed for the task to which it is put, nor perfectly configured to work with other middleware or devices it encounters and thus running 'sub-optimally' but functioning nonetheless (Mackenzie 2005). Indeed Matt Locke eloquently describes the granularity of this new digital terrain:

> 'Mobile networks have to negotiate the architecture of spaces that they attempt to inhabit. Although the interfaces have removed themselves from

> physical architectures, the radio waves that connect cell spaces are refracted and reflected by the same obstacles, creating not a seamless network but a series of ebbs and flows. The supposedly flat space of the network is in fact not flat, pulled into troughs and peaks by the gravity of architecture and the users themselves.'(Manovich 2006: 228-9)

Quite the opposite of a 'global brain' or total vision then, we may find that temporary and 'good-enough' may lead to 'local aggregations of self-connecting systems can become islands of coherence in the chaos raised by pervasive computing' (McCullough 2004: 71). Far from the pure vision of what de Certeau calls the 'concept city', we may find the production of myriads and little stories. Some commercial, some personal, maybe some militarised. There is a real issue about proliferating knowledges circulating routinely and more or less autonomously of people. But amidst all this is the potential to create new formations and momentary stabilities. What remains less clear whether this is merely making what was formerly protected by its opacity and transitoriness, visible and recordable. As such there may well be an issue where rendering our tacit socio-spatial practices visible is an uncomfortably close echo of commodified and surveillant systems.

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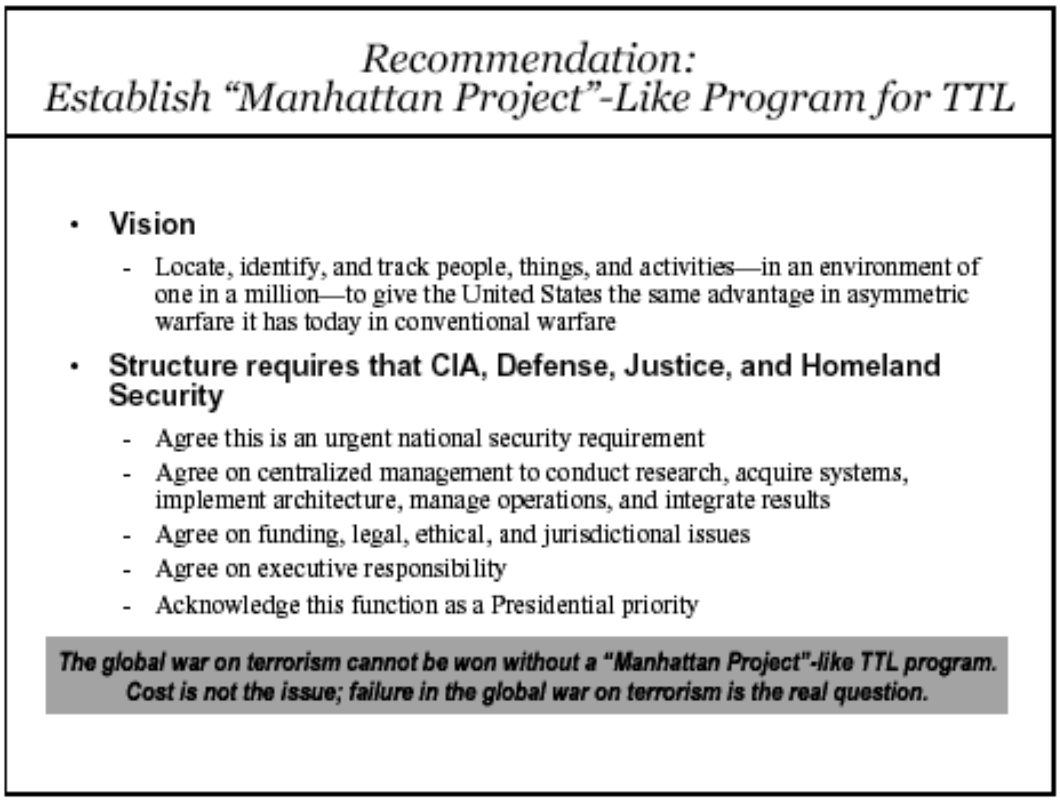

Figure 1: The US Defense Science Board's call for a New Manhattan Project based on Ambient Intelligence for 'Tracking, Targeting and Locating' (TTL) (DSB, 2004, 189).

Figure 2 The Defense Science Board's diagnosis of the way in which US 'targets' in the 'war on terror' blend seamlessly into wider, civilian life in cities (DSB, 2004, 180).

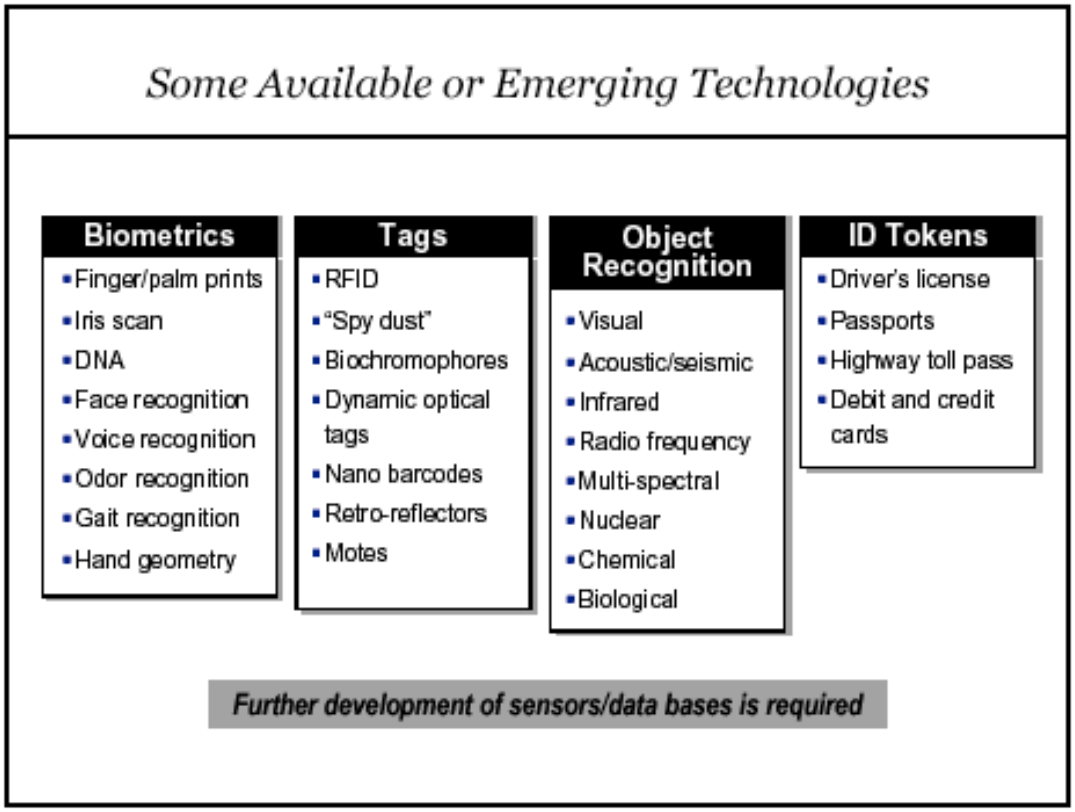

Figure 3: The US Defense Science Board's 2004 Assessment of the possible ubiquitous computing, ambient, biometricand surveillance technologies which might be exploited for new 'Tracking, Targeting and Locating' system geared to the global 'War on terror' (DSB, 2004, 184).

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[i] There are technical choices buried in this, with different effects of say an 'epidemic' model of relayed information or a proximity constrained models where devices communicate on a limited range.